

GEOLOGY, BS

Program Description

The mission of the Geology Program is to provide integrated and process-oriented curricula, based on fundamental scientific principles and processes that enable graduates to pursue challenging careers and maintain lifelong learning. The Geology Program is designed to serve students majoring in geology and environmental science as well as students in other fields who are interested in adding to their knowledge of the Earth. Members of the geoscience faculty provide majors with a broad overview of geologic processes while offering the opportunity to pursue specialized knowledge in selected areas of geoscience in preparation for graduate study and careers in government, industry, or academia.

Students can earn a Bachelor of Science degree in Geology by following the degree plan for geology majors as described below. Students considering certification for 4-8 level science teaching should consult the Science, Mathematics and Technology Education (SMTE) section of this catalog.

Student Learning Outcomes

Students will:

- show competence in scientific inquiry, writing, and oral presentation;
- demonstrate a broad understanding of major concepts central to the geological sciences;
- demonstrate competency and be able to apply field and laboratory methods, perform data analysis, and utilize computer applications relevant to the geological sciences;
- be able to evaluate and critically discuss issues related to geology that impact society.

Fast Track from Bachelor's to Master's Degree

The university allows the opportunity for high-achieving students to count a select number of graduate credits toward their undergraduate degree and thereby obtain a graduate degree at an accelerated pace. For more information, see Fast Track Geology, BS and Environmental Science, MS (<http://catalog.tamucc.edu/undergraduate/science/fast-track/fast-track-geology-bs-environmental-science-ms/>).

General Requirements

The minimum requirement for a Bachelor of Science Degree in Geology is a total of 120 hours, divided among the following areas:

Requirements	Credit Hours
Core Curriculum Program (http://catalog.tamucc.edu/undergraduate/university-college/programs/core-curriculum-program/)	42
First-Year Seminars (when applicable) ¹	0-2
Supporting Courses	8
Geology Core	42

Geology Tracks	28-36
Total Credit Hours	120-130

1

Full-time, first time in college students are required to take the first-year seminars.

- UNIV 1101 University Seminar I (1 sch)
- UNIV 1102 University Seminar II (1 sch)

Program Requirements

Code	Title	Hours
Full-time, First-year Students		
UNIV 1101	University Seminar I	1
UNIV 1102	University Seminar II	1
Core Curriculum Program		
University Core Curriculum		42
Students majoring in Geology use the following:		
MATH 2413	Calculus I (3 hrs Mathematics requirement, 1 hr Component Area Option)	
CHEM 1411	General Chemistry I (3 hrs Life/Physical Science requirement/1 hr Component Area Option)	
CHEM 1412	General Chemistry II (3 hrs Life/Physical Science requirement/1 hr Component Area Option)	
Select one of the following:		
PHYS 1401	General Physics I (3 hrs Component Area Option/1 hr Supporting courses)	
PHYS 2425	University Physics I (3 hrs Component Area Option/1 hr Supporting courses)	
Supporting Courses		
Supporting courses may not be taken on a pass/no pass (P/NP) basis		
CHEM 1411	General Chemistry I (included in University Core)	
CHEM 1412	General Chemistry II (included in University Core)	
MATH 2413	Calculus I (included in University Core)	
PHYS 1401	General Physics I (3 hours included in University Core, 1 hour included in Supporting courses)	1
or PHYS 2425	University Physics I	
PHYS 1402	General Physics II	4
or PHYS 2426	University Physics II	
MATH 3342	Applied Probability and Statistics	3
Geology Core		
GEOL 1403	Physical Geology	4
GEOL 1404	Historical Geology	4
GEOL 2102	Undergraduate Seminar in Geology-Careers in the Geosciences	1
or GEOL 2103	Undergraduate Seminar in Geology-Research in the Geosciences	
GEOL 3411	Mineralogy	4
GEOL 3326	Introduction to Geological Field Methods	3
GEOL 3414	Igneous and Metamorphic Petrology	4
GEOL 4411	Sedimentation and Stratigraphy	4
GEOL 4421	Structural Geology	4
GEOL 4422	Geophysics	4
GEOL 4650	Field Geology	6

GEOL 4444	Hydrogeology	4
or GEOL 4416	Introduction to Geochemistry	

Tracks

Select one of the following Tracks: 28-36

General Geology Track (p. 2)

Geochemistry Track (p. 2)

Environmental Geology Track (p. 2)

Energy Resources Track (p. 3)

Total Hours 122-130

1

Note that PHYS 2425 University Physics I (4 sch)/PHYS 2426 University Physics II (4 sch) are required for some tracks and PHYS 2426 University Physics II (4 sch) required MATH 2414 Calculus II (4 sch) as a prerequisite.

*

Online offering

^

Blended offering

General Geology Track

The General Geology track is designed to serve students majoring in geology and environmental science as well as students in other fields who are interested in a broad overview of geologic processes. In addition, there are opportunities to pursue specialized knowledge in selected areas of geoscience in preparation for graduate study and careers in government, industry, or academia.

Code	Title	Hours
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Designated Electives

Select 15 hours from the following: ¹ 15

GEOL 2222 Karst Geology and Paleoclimatology

GEOL 3329 Geology of National Parks

GEOL 3441 Invertebrate Paleontology

GEOL 3442 Geomorphology

GEOL 3443 Environmental Geology

GEOL 4316 Marine Geoscience

GEOL 4321 Introduction to Soil and Groundwater Restoration

GEOL 4415 Economic Geology

GEOL 4430 Internship in Geology

GEOL 4436 Introduction to Petroleum Geology

GEOL 4490 Selected Topics

GEOL 4311 Paleoclimatology

GEOL 4444 Hydrogeology (if not taken in the Geology Core)

GEOL 4416 Introduction to Geochemistry (if not taken in the Geology Core)

Approved Science Electives

Select 13 hours from Environmental Science, Chemistry, Geographic Information Science, Engineering, Physics, Biology, Mathematics or other appropriate area ² 13

Total Hours 28

1

In choosing electives, students must make sure they meet the University's 45 upper-division credit hour requirement.

2

See also the designated electives listed on the Geochemistry, Environmental Geology and Energy Resources Tracks.

Geochemistry Track

The Geochemistry track focuses on the relationships between aqueous solutions, equilibrium thermodynamics and kinetics, acid-base equilibria, redox reactions, carbon chemistry, organic compounds, biogeochemical cycles, microbial influences and geological processes. These relationships are applied to understand the complex interactions among the atmospheric, continental and marine environments.

Code	Title	Hours
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Required Courses

GEOL 4416 Introduction to Geochemistry ¹ 4

CHEM 3418 Instrumental Analysis 4

Designated Electives

Select 24 hours from the following: ^{2,3} 24

CHEM 3411 Organic Chemistry I

CHEM 4344 Chemical Oceanography

CHEM 4401 Biochemistry I

CHEM 4407 Inorganic Chemistry

CHEM 4443 Environmental Chemistry

ESCI 3202 Professional Skills

ESCI 3351 Oceanography

GEOL 4444 Hydrogeology

CHEM 3412 Organic Chemistry II

CHEM 3417 Quantitative Analysis

CHEM 4423 Physical Chemistry I

CHEM 4490 Special Topics ⁴

GEOL 4430 Internship in Geology

GEOL 4490 Selected Topics ⁵

GEOL 4496 Directed Independent Study

Total Hours 32

1

4 credit hours for the GEOL 4416 Introduction to Geochemistry (4 sch) are included in the Geology core and are not included in the total for this selection.

2

In choosing electives, students must make sure they meet the University's 45 upper-division credit hour requirement.

3

Additional hours not listed may be approved by Faculty mentor.

4

CHEM 4490 Special Topics (4 sch) includes topics such as Organic Geochemistry, Aquatic Chemistry, Stable Isotope Biogeochemistry.

5

GEOL 4490 Selected Topics (4 sch) includes Groundwater Geochemistry.

Environmental Geology Track

The Environmental Geology track is designed to provide students with a broad training for careers in different aspects of the environmental

geosciences including: water resources, water quality, and the hydrogeochemistry of natural waters.

Code	Title	Hours
Required Courses		
PHYS 2425	University Physics I (included in University Core) ¹	
PHYS 2426	University Physics II (included in University Core) ¹	
MATH 2414	Calculus II ¹	4
GEOL 3443	Environmental Geology	4
GEOL 4444	Hydrogeology ²	4
Designated Electives		
Select 24 hours from the following: ^{3,4}		24
GEOL 2222	Karst Geology and Paleoclimatology	
GEOL 4311	Paleoclimatology	
GEOL 4321	Introduction to Soil and Groundwater Restoration	
GEOL 4416	Introduction to Geochemistry	
GEOL 4430	Internship in Geology	
GEOL 4490	Selected Topics	
GEOL 4496	Directed Independent Study	
ATSC 4305	Remote Sensing ⁵	
ESCI 3351	Oceanography	
ESCI 4301	Environmental Regulations	
ESCI 4230	Oil Spill Prevention and Response Theory	
ESCI 4130	Oil Spill Prevention and Response Lab	
ESCI 4335	Climate and Climate Variability	
ESCI 4270	Hazardous Waste Operations and Emergency Response Theory	
ESCI 4170	Hazardous Waste Operations and Emergency Response Lab	
ESCI 3202	Professional Skills	
GISC 1470	Geospatial Systems I	
GISC 2438	Web Map Development ⁶	
GISC 3300	Geospatial Mathematical Techniques ⁷	
GISC 4431	Remote Sensing and Photogrammetry ⁸	
Total Hours		36

1

Note that PHYS 2425 University Physics I (4 sch)/PHYS 2426 University Physics II (4 sch) and MATH 2414 Calculus II (4 sch) are required for some courses part of this track.

2

4 credit hours for the GEOL 4444 Hydrogeology (4 sch) are included in the Geology core and are not included in the total for this section.

3

In choosing electives, students must make sure they meet the University's 45 upper-division credit hour requirement.

4

Additional hours not listed may be approved by Faculty Mentor.

5

ATSC 4305 Remote Sensing (3 sch) has PHYS 2426 University Physics II (4 sch) as pre-requisite.

6

GISC 2438 Web Map Development (4 sch) has GISC 1470 Geospatial Systems I (4 sch) & COSC 1435 Introduction to Problem Solving with Computers I (4 sch) as pre-requisites.

7

GISC 3300 Geospatial Mathematical Techniques (3 sch) has MATH 2413 Calculus I (4 sch) and MATH 2414 Calculus II (4 sch) as pre-requisites.

8

GISC 4431 Remote Sensing and Photogrammetry (4 sch) has GISC 3300 Geospatial Mathematical Techniques (3 sch) as pre-requisite.

Energy Resources Track

The Energy Resources track offers the engineering and geology background for exploration and production of hydrocarbons, gas hydrates and renewable resources such as geothermal energy.

Code	Title	Hours
Required Courses		
GEOL 4436	Introduction to Petroleum Geology	4
or ESCI 4490	Selected Topics	
PHYS 2425	University Physics I (included in Supporting courses) ¹	
PHYS 2426	University Physics II (included in Supporting courses) ¹	
MATH 2414	Calculus II	4
Designated Electives		
Select 20-21 hours from the following: ^{2,3}		20-21
ENGR 2325	Statics	
ENGR 2326	Dynamics ⁴	
ENGR 3316	Thermodynamics	
GEOL 4430	Internship in Geology	
GEOL 4490	Selected Topics	
GEOL 4496	Directed Independent Study	
Total Hours		28-29

1

Must take PHYS 2425 University Physics I (4 sch) and PHYS 2426 University Physics II (4 sch) in Supporting courses.

2

In choosing electives, students must make sure they meet the University's 45 upper-division credit hour requirement.

3

Engineering pre-requisite courses and/or additional hours not listed may be approved by Faculty Mentor.

4

ENGR 2326 Dynamics (3 sch) has ENGR 2325 Statics (3 sch) as pre-requisite.

Optional Minor in Another Subject

Geology majors may choose to complete a minor in an approved subject. Course requirements for the minor involve at least 18 semester hours, and the content is specified by faculty in the minor field. Minors in biology, chemistry, computer science, environmental science, geographic information science, and mathematics are generally appropriate for

geology majors. Minors in other disciplines or combination minors may be arranged in consultation with the academic advisor.

Course Sequencing

General Geology

First Year

Fall		Hours
GEOL 1403	Physical Geology	4
MATH 2413	Calculus I	4
UNIV 1101	University Seminar I	1
ENGL 1301 or ENGL 1302	Writing and Rhetoric I or Writing and Rhetoric II	3
COMM 1311	Foundation of Communication	3
Hours		15

Spring

GEOL 1404	Historical Geology	4
CHEM 1411	General Chemistry I	4
PHYS 1401	General Physics I	4
UNIV 1102	University Seminar II	1
GEOL 2102	Undergraduate Seminar in Geology-Careers in the Geosciences	1
Hours		14

Second Year

Fall		Hours
GEOL 3411	Mineralogy	4
CHEM 1412	General Chemistry II	4
PHYS 1402	General Physics II	4
POLS 2305	U.S. Government and Politics	3
Hours		15

Spring

GEOL 2222	Karst Geology and Paleoclimatology	2
MATH 3342	Applied Probability and Statistics	3
GEOL/Science Elective		4
GEOL 2103	Undergraduate Seminar in Geology-Research in the Geosciences	1
American History Core Requirement		3
Hours		13

Third Year

Fall		Hours
GEOL 4416	Introduction to Geochemistry	4
GEOL Elective		4
POLS 2306	State and Local Government	3
American History Core Requirement		3
Hours		14

Spring

GEOL 3414	Igneous and Metamorphic Petrology	4
ARTS 1301	Art and Society	3
Language, Philosophy & Culture Core Requirement		3
GEOL/Science Elective		4
Hours		14

Fourth Year

Fall

GEOL 4411	Sedimentation and Stratigraphy	4
GEOL 4421	Structural Geology	4
GEOL/Science Elective		4
Social and Behavioral Sciences Core Requirement		3
Hours		15

Spring

GEOL 3326	Introduction to Geological Field Methods	3
GEOL 4444	Hydrogeology	4
GEOL 4422	Geophysics	4
GEOL/Science Elective		4
Hours		15

Summer

GEOL 4650	Field Geology	6
Hours		6

Total Hours **121**

Geochemistry Track

First Year

Fall		Hours
GEOL 1403	Physical Geology	4
MATH 2413	Calculus I	4
UNIV 1101	University Seminar I	1
ENGL 1301 or ENGL 1302	Writing and Rhetoric I or Writing and Rhetoric II	3
COMM 1311	Foundation of Communication	3
Hours		15

Spring

GEOL 1404	Historical Geology	4
CHEM 1411	General Chemistry I	4
PHYS 1401	General Physics I	4
UNIV 1102	University Seminar II	1
GEOL 2102	Undergraduate Seminar in Geology-Careers in the Geosciences	1
Hours		14

Second Year

Fall		Hours
GEOL 3411	Mineralogy	4
CHEM 1412	General Chemistry II	4
PHYS 1402	General Physics II	4
POLS 2305	U.S. Government and Politics	3
Hours		15

Spring

GEOL 2222	Karst Geology and Paleoclimatology	2
MATH 3342	Applied Probability and Statistics	3
GEOL/Science Elective		4
GEOL 2103	Undergraduate Seminar in Geology-Research in the Geosciences	1
American History Core Requirement		3
Hours		13

Third Year

Fall		
GEOL 4416	Introduction to Geochemistry	4
CHEM 3418	Instrumental Analysis	4
POLS 2306	State and Local Government	3
American History Core Requirement		3
Hours		14

Spring		
GEOL 3414	Igneous and Metamorphic Petrology	4
ARTS 1301	Art and Society	3
Language, Philosophy & Culture Core Requirement		3
GEOL/Science Elective		4
Hours		14

Fourth Year

Fall		
GEOL 4411	Sedimentation and Stratigraphy	4
GEOL 4421	Structural Geology	4
GEOL/Science Elective		4
Social and Behavioral Sciences Core Requirement		3
Hours		15

Spring		
GEOL 3326	Introduction to Geological Field Methods	3
GEOL 4444	Hydrogeology	4
GEOL 4422	Geophysics	4
GEOL/Science Elective		4
Hours		15

Summer		
GEOL 4650	Field Geology	6
Hours		6

Total Hours 121

Environmental Geology Track

First Year

Fall		Hours
GEOL 1403	Physical Geology	4
MATH 2413	Calculus I	4
UNIV 1101	University Seminar I	1
ENGL 1301 or ENGL 1302	Writing and Rhetoric I or Writing and Rhetoric II	3
COMM 1311	Foundation of Communication	3
Hours		15

Spring		
GEOL 1404	Historical Geology	4
CHEM 1411	General Chemistry I	4
PHYS 1401	General Physics I	4
UNIV 1102	University Seminar II	1
GEOL 2102	Undergraduate Seminar in Geology-Careers in the Geosciences	1
Hours		14

Second Year

Fall		
GEOL 3411	Mineralogy	4

CHEM 1412	General Chemistry II	4
PHYS 1402	General Physics II	4
POLS 2305	U.S. Government and Politics	3

Hours 15

Spring		
GEOL 2222	Karst Geology and Paleoclimatology	2
MATH 3342	Applied Probability and Statistics	3
GEOL/Science Elective		4
GEOL 2103	Undergraduate Seminar in Geology-Research in the Geosciences	1
American History Core Requirement		3

Hours 13

Third Year

Fall		
GEOL 4416	Introduction to Geochemistry	4
GEOL 3443	Environmental Geology	4
POLS 2306	State and Local Government	3
American History Core Requirement		3
Hours		14

Spring		
GEOL 3414	Igneous and Metamorphic Petrology	4
ARTS 1301	Art and Society	3
Language, Philosophy & Culture Core Requirement		3
GEOL/Science Elective		4
Hours		14

Fourth Year

Fall		
GEOL 4411	Sedimentation and Stratigraphy	4
GEOL 4421	Structural Geology	4
GEOL/Science Elective		4
Social and Behavioral Sciences Core Requirement		3
Hours		15

Spring		
GEOL 3326	Introduction to Geological Field Methods	3
GEOL 4444	Hydrogeology	4
GEOL 4422	Geophysics	4
GEOL/Science Elective		4
Hours		15

Summer		
GEOL 4650	Field Geology	6
Hours		6

Total Hours 121

Energy Resources Track

First Year

Fall		Hours
GEOL 1403	Physical Geology	4
MATH 2413	Calculus I	4
UNIV 1101	University Seminar I	1
ENGL 1301 or ENGL 1302	Writing and Rhetoric I or Writing and Rhetoric II	3

COMM 1311	Foundation of Communication	3
Hours		15
Spring		
GEOL 1404	Historical Geology	4
CHEM 1411	General Chemistry I	4
PHYS 1401	General Physics I	4
UNIV 1102	University Seminar II	1
GEOL 2102	Undergraduate Seminar in Geology-Careers in the Geosciences	1
Hours		14
Second Year		
Fall		
GEOL 3411	Mineralogy	4
CHEM 1412	General Chemistry II	4
PHYS 1402	General Physics II	4
POLS 2305	U.S. Government and Politics	3
Hours		15
Spring		
GEOL 2222	Karst Geology and Paleoclimatology	2
MATH 3342	Applied Probability and Statistics	3
GEOL/Science Elective		4
GEOL 2103	Undergraduate Seminar in Geology-Research in the Geosciences	1
American History Core Requirement		3
Hours		13
Third Year		
Fall		
GEOL 4416	Introduction to Geochemistry	4
GEOL/Science Elective		4
POLS 2306	State and Local Government	3
American History Core Requirement		3
Hours		14
Spring		
GEOL 3414	Igneous and Metamorphic Petrology	4
ARTS 1301	Art and Society	3
Language, Philosophy & Culture Core Requirement		3
GEOL/Science Elective		4
Hours		14
Fourth Year		
Fall		
GEOL 4411	Sedimentation and Stratigraphy	4
GEOL 4421	Structural Geology	4
GEOL 4436	Introduction to Petroleum Geology	4
Social and Behavioral Sciences Core Requirement		3
Hours		15
Spring		
GEOL 3326	Introduction to Geological Field Methods	3
GEOL 4444	Hydrogeology	4
GEOL 4422	Geophysics	4
GEOL/Science Elective		4
Hours		15

Summer

GEOL 4650	Field Geology	6
Hours		6
Total Hours		121

Courses**GEOL 1303 Essentials of Geology****3 Semester Credit Hours (3 Lecture Hours)**

One-semester introductory Earth science course for students majoring in a non-science subject area. Covers basic geologic material and concepts, such as minerals, rocks, the rock cycle, and plate tectonics theory. Origin, composition, and evolution of our planet, as well as the importance of geology in everyday life, including geologic resources, global change, earthquakes, and volcanism are examined. This course is not recommended for students majoring in Geology or Environmental Sciences. Course counts toward the natural science component of the Core Curriculum Program.

TCCNS: GEOL 1303

GEOL 1403 Physical Geology**4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)**

Introduction to the origin, classification, and composition of Earth materials. Study of internal and surface processes which shape and modify Earth. Laboratory studies of minerals and rocks, as well as topographic maps, geologic maps and geologic cross-sections.

Co-requisite: SMTE 0094.

TCCNS: GEOL 1403

GEOL 1404 Historical Geology**4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)**

Introduction to the origin and evolution of Earth and other planets. Changes in the form and distribution of Earth's continents and oceans, and succession of plants and animals through geologic time. Laboratory studies of fossils, geological maps, and the interpretation of ancient environments of rock formation.

Prerequisite: GEOL 1403 or 1303.

Co-requisite: SMTE 0094.

TCCNS: GEOL 1404

GEOL 2102 Undergraduate Seminar in Geology-Careers in the Geosciences**1 Semester Credit Hour (1 Lecture Hour)**

Introductory level seminar featuring diverse topics and speakers. Focus on careers in the geosciences as well as on how to successfully plan a college career. In-house as well as external speakers. May not be repeated for credit but attendance in subsequent semesters is encouraged.

GEOL 2103 Undergraduate Seminar in Geology-Research in the Geosciences**1 Semester Credit Hour (1 Lecture Hour)**

Introductory level seminar featuring diverse topics and speakers. Focus on current geologic research. In-house as well as external speakers. May not be repeated for credit but attendance in subsequent semesters is highly encouraged. Credit/no credit

GEOL 2222 Karst Geology and Paleoclimatology**2 Semester Credit Hours (1 Lecture Hour)**

This course describes the different types of caves and karst rocks, the water rock interactions in carbonate rock systems, and it explains cave formation via hydrological and geochemical processes. It also deals with how speleothem proxies such as oxygen and carbon stable isotope, trace elements, carbonate petrography are used to decipher past changes in climate.

GEOL 2490 Selected Topics**1-4 Semester Credit Hours (1-4 Lecture Hours, 6 Lab Hours)**

May be repeated for credit if topics are significantly different. Subject material variable. Faculty approval required.

GEOL 3326 Introduction to Geological Field Methods**3 Semester Credit Hours (2 Lecture Hours, 3 Lab Hours)**

Introduction to the basic techniques of geological fieldwork. Note taking in the field, proper use of geological field equipment, measurement and description of rock sections by several methods and degrees of detail, plus small area mapping of several types of terrain with topographic maps. Reports, sections, and maps will be produced from the field notes. Field trips required.

Prerequisite: GEOL 1403 and 1404 and (GEOL 3411 or 3411*).

* May be taken concurrently.

Co-requisite: SMTE 0094.

GEOL 3329 Geology of National Parks**3 Semester Credit Hours (3 Lecture Hours)**

Introduction to the regional geology of the United States using selected U.S. National Parks representing a wide variety of geologic settings as examples. Application of major geologic principles and basic geologic concepts such as plate tectonics, rock cycle, stratigraphy, and geologic time.

Prerequisite: GEOL 1303, 1403 or 1404.

GEOL 3411 Mineralogy**4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)**

Study of the physical and chemical properties of minerals. Introduction to the crystallography of minerals, optical mineralogy, and the use of the polarized light microscope. Laboratory study of mineral identification in hand specimens and thin sections.

Prerequisite: GEOL 1403 and CHEM 1411 and (CHEM 1412 or 1412*).

* May be taken concurrently.

Co-requisite: SMTE 0094.

GEOL 3414 Igneous and Metamorphic Petrology**4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)**

Genesis and occurrence of igneous and metamorphic rocks. Mineralogical composition and thermodynamics of geologic systems. Determination of rock types in hand specimens and thin sections.

Prerequisite: GEOL 1403, CHEM 1411, 1412 and GEOL 3411.

Co-requisite: SMTE 0094.

GEOL 3441 Invertebrate Paleontology**4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)**

Morphology, classification, and paleoecology of fossil invertebrates. Applications to marine geology including paleoceanography, stratigraphy, economic geology. Field trip to Texas invertebrate fossil beds.

Prerequisite: GEOL 1404.

Co-requisite: SMTE 0094.

GEOL 3442 Geomorphology**4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)**

Study of landscapes and landforms at the surface of the Earth, and the processes and mechanisms by which they are developed.

Prerequisite: GEOL 1403.

Co-requisite: SMTE 0094.

GEOL 3443 Environmental Geology**4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)**

Study of the relationships of humans to Earth's physical environment. Geologic aspects of waste disposal, resources, conservation, land reclamation, geologic hazards, and land-use planning.

Prerequisite: GEOL 1403.

Co-requisite: SMTE 0094.

GEOL 3490 Selected Topics**1-4 Semester Credit Hours (1-4 Lecture Hours)**

May be repeated for credit if topics are significantly different. Subject materials variable.

GEOL 4311 Paleoclimatology**3 Semester Credit Hours (3 Lecture Hours)**

Reconstruction of Earth's climate system through time using natural archives and proxy evidence. Focus is mostly towards the Quaternary, though longer time spans will be considered, too. Mixed format with lectures, hand-on activities involving paleoclimate data sets, and seminar-style readings and discussions.

Prerequisite: GEOL 1403, ATSC 4335* or ESCI 4335*.

* May be taken concurrently.

GEOL 4316 Marine Geoscience**3 Semester Credit Hours (3 Lecture Hours)**

Introduction to the geology of the marine environment. Review of plate tectonic processes relevant to the evolution of continental margins and plate boundaries; geophysics and ocean morphology; geology of ocean crust; controls on the types, origin, and distribution of marine sediments; marine geochemistry; nearshore geological processes and the continental shelf; introduction to paleoceanography; global paleoceanographic evolution; critical events in ocean history. Special focus on the Gulf of Mexico.

Prerequisite: GEOL 1403, 1404, CHEM 1411 and 1412.

GEOL 4321 Introduction to Soil and Groundwater Restoration**3 Semester Credit Hours (3 Lecture Hours)**

Introduction to methods for restoring contaminated soil and groundwater by examining the factors and processes influencing the efficacy of remediation systems. An emphasis will be placed on the scientific principles upon which soil and groundwater remediation is based.

Prerequisite: (GEOL 1403, CHEM 1411, 1412 and GEOL 3443).

GEOL 4411 Sedimentation and Stratigraphy**4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)**

Composition and origin of sediments and sedimentary rocks. Description and classification of rocks in hand specimen. Principles of stratigraphy, including stratigraphic units and correlation. Facies models for major depositional systems. Field trips.

Prerequisite: (GEOL 1403) and (GEOL 1404) and (GEOL 3411*).

* May be taken concurrently.

Co-requisite: SMTE 0094.

GEOL 4415 Economic Geology**4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)**

Study of geologic and tectonic parameters of mineral and metals formation. Ore geology and geochemistry. Mining, processing, fabrication, and marketing of natural resources. Field trip to mining operations.

Prerequisite: GEOL 1403 and 3411.

Co-requisite: SMTE 0094.

GEOL 4416 Introduction to Geochemistry**4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)**

Introductory study of the Earth processes using principles of chemical equilibrium, thermodynamics, isotope geochemistry and organic geochemistry. Applications of low-temperature geochemistry to geologic problems.

Prerequisite: CHEM 1411, 1412 and MATH 2413.

Co-requisite: SMTE 0094.

GEOL 4421 Structural Geology**4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)**

PHYS 1401 Geometric and quantitative description of deformation of the Earth's crust, mechanics of brittle and crystal-plastic deformation processes of Earth materials, introduction to continuum mechanics of geologic systems, crustal deformation from micro-scale to global tectonics. Laboratory introduces principles of three-dimensional data representation and analysis, geologic map interpretation, cross-section techniques, and problems in stress and strain analysis.

Prerequisite: GEOL 3411 and MATH 2413 and (PHYS 1401 or 2425).

Co-requisite: SMTE 0094.

GEOL 4422 Geophysics**4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)**

Introduction to quantitative techniques to assess physical properties and processes of the Earth. Topics include earthquake seismology, refraction and reflection seismology, gravimetry, magnetism, electrical methods, and radioactivity of Earth materials. Application of geophysical methods to the study of the Earth, in oil and gas exploration, and in economic and environmental geology.

Prerequisite: (GEOL 4421, PHYS 1401 or 2425) and (PHYS 1402 or 2426) and (MATH 2413).

GEOL 4423 Seismic Methods**4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)**

Introduction to the acquisition, processing, and interpretation of 2D and 3D seismic data. Lectures and field exercises are covered. Topics include conceptual and historical foundations of modern reflection seismology; an overview of seismic wave phenomena in acoustic, elastic, and porous media; acquisition principles for land and marine seismic surveys; methods used to create 2D and 3D seismic images from field data; concepts of dip moveout, prestack migration, and depth migration; concepts and limitations of 3D seismic interpretation for structure, stratigraphy, and rock property estimation; and the interpretation role of attributes, impedance estimation, and AVO.

Prerequisite: GEOL 4422.

GEOL 4424 Environmental and Engineering Geophysics**4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)**

Geophysical techniques for exploring the shallow subsurface for environmental and engineering purposes. Topics include seismic, resistivity, ground penetrating radar, electromagnetic, gravity, and magnetic methods. This course includes both lectures and labs (field exercises) components.

Prerequisite: (PHYS 1401 or 2425) and (PHYS 1402 or 2426) and (MATH 2413).

GEOL 4430 Internship in Geology**1-4 Semester Credit Hours**

One to four semester hours of credit may be earned by working in an internship position in industry, with local government, a private firm, or an independent geologist.

GEOL 4436 Introduction to Petroleum Geology**4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)**

Basic concepts of petroleum geology and techniques used in the exploration and production of hydrocarbon systems. Lectures and lab exercises will cover principles of stratigraphy, sedimentology, hydrocarbon generation, hydrocarbon-trapping mechanisms, reservoir characterization, seismic interpretation, well-log interpretation, and geologic risk analysis.

Prerequisite: GEOL 4411 or 4411*.

* May be taken concurrently.

Co-requisite: SMTE 0094.

GEOL 4444 Hydrogeology**4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)**

Introduction to the fundamentals of groundwater and surface water flow; well hydraulics and evaluation of groundwater as a resource; chemical properties of groundwater and groundwater contamination; groundwater and the environment; and groundwater modeling. This course also examines some of the techniques associated with field hydrogeology and laboratory methods in hydrogeology.

Prerequisite: GEOL 1403 and (PHYS 1401 or 2425).

Co-requisite: SMTE 0094.

GEOL 4490 Selected Topics**4 Semester Credit Hours (1-4 Lecture Hours, 1-4 Lab Hours)**

May be repeated for credit if topics are significantly different. Subject materials variable.

GEOL 4496 Directed Independent Study**1-4 Semester Credit Hours**

DIRECTED INDEPENDENT STUDY Requires a formal proposal of study to be completed in advance of registration and to be approved by the supervising faculty, the chairperson, and the Dean of the College.

GEOL 4649 Karst of the Yucatan Peninsula**6 Semester Credit Hours (3 Lecture Hours, 6 Lab Hours)**

This course describes the different types of caves and karst rocks, the water rock interactions in carbonate rock systems, and it explains cave formation via hydrogeological and geochemical processes. It offers field work experience such as sample collection, determining field parameters, karst and cave surveys, measuring spring discharges in the Yucatán Peninsula of Mexico and laboratory experience on the Texas A&M University-Corpus Christi campus.

Prerequisite: (GEOL 1403 and 4411) or GEOL 4444, 4416 or 4311.

GEOL 4650 Field Geology**6 Semester Credit Hours (12 Lab Hours)**

Field course involving practical application of geologic principles to field problems. Locations visited and material covered depends on hosting institution. Generally should include: mapping and data collection; measurement of stratigraphic sections; mapping and preparation of geologic cross-sections; preparation of geologic reports.

Prerequisite: GEOL 3326, 4411, 4421, 4416, 4444 or 4422.

Co-requisite: SMTE 0094.